REMARKS

Claims 1-20 are all the claims pending in the application. By this Amendment, Applicant amends claim 1 as agreed during Examiner's Interview. No new subject matter has been added.

I. The Office Action

Claims 1-18 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mori (JP Patent Document No. 2001/105106) in view of Kimura (U.S. Patent No. 4,779,775).

Claim 19 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Mori, in view of Kimura, and Muench (U.S. Patent No. 4,977,950).

II. Statement of Substance of Interview

Applicants gratefully acknowledge a personal interview granted by Supervisory Examiner Tran and Examiner Hogan, conducted June 29, 2010. Supervisory Examiner Tran stated that the Kimura and Muench references are not applicable and would be removed. Further, Supervisory Examiner Tran stated that claim 1 would be distinguishable over Mori if claim 1 is amended to further define that the independent members are spaced apart by a flat surface.

Accordingly, Applicants amend claim 1 in accordance with the reached agreement and respectfully request the rejections over Mori, Kimura, and Muench be withdrawn.

III. Claims 1-20 are Allowable

Claim 1 recites among other elements: "the base portions of the independent members are spaced apart from one another by portions of a flat surface of the inner surface area of the molten steel flow hole portion."

Mori describes an immersion nozzle having an inner hole surface in a rugged shape. A depth from a top of the projection to a bottom of the recession is 0.5-5mm. The distance between center points of the neighboring projections or recessions is 1-20mm. (Abstract, Fig. 2).

The Examiner concedes that Mori does not teach discontinuous protrusions in directions parallel and perpendicular to a molten steel flowing direction. (*See* Office Action, page 2, last paragraph). Applicants agree with the Examiner.

As seen in Fig. 2, Mori's wave-like inner hole surface does not include discontinuous independent protrusion portions or concave portions. Additionally, the "waves" of Mori are not spaced apart by a flat surface, as claimed.

The Examiner asserts that Kimura teaches "small reticulate holes" on a casting nozzle that are discontinuous in both directions. (*See* Office Action, page 2, last paragraph, lines 8-9).

Kimura teaches wrapping a reticulate material 4a around a cylindrical body. (Col. 3, lines 5-10, FIG. 2). The cylindrical body is fixed onto the core metal that forms the pouring hole, with the reticulate material (4a). The spaces are filled with an alumina-graphite body to form the nozzle proper and a zirconia-graphite body to form the protective layer. The outlets (5) are made by drilling where the reticulate material is disposed. (FIG. 2e). The reticulate material provides small holes for gas blowing into the outlets (5). (Col. 2, 61-64).

Accordingly, as described by Kimura and seen in FIGS. 2(e) and 2(f), the reticulate material is placed inside the material which forms the nozzle. Further, the holes are formed by drilling through the reticulate material. Thus, these small holes are formed only on the surface of the drilled outlets (5). Moreover, these holes are connected by a net which forms the reticulate material, to blow the gas into the outlets (5).

Accordingly, Kimura does not cure any deficiency of Mori.

Additionally, Mori teaches a distance between the peaks of the waves d of 0.5-5mm and a distance between center points of the protrusions g of 1-20mm. However, as claimed, a length of the base $L > 2 \times H$. Mori does not teach or suggest a relationship between the maximum height of the protrusions and the maximum size of the base portion. In other words, Mori does not teach that g is greater than 2d.

Since an exemplary embodiment provides improved performance of the immersion nozzle, as discovered by Applicants, the exemplary embodiment cannot be obvious. As described and documented in the specification of the present application, it took a great deal of experimentation and trying to discover the appropriate dimensions of the independent members and relationships between the maximum length of the base portion of the independent members and their maximum heights. The same is true for the various shapes of the independent members and their positioning in the inner hole.

Accordingly, Applicants respectfully submit that neither Mori, nor Kimura, taken singularly or in combination, teaches or suggests at least "the base portions of the independent members are spaced apart from one another by portions of a flat surface of the inner surface area of the molten steel flow hole portion."

Accordingly, **claim 1 and dependent claims 2-18 and 20** are patentable over Mori and Kimura.

Additionally, **claim 2** recites "an expression: $L \leq \pi D/3$ in which L is the maximum length of a base portion of the protrusion portion or the concave portion, and D is an inner diameter of the nozzle before the protrusion portions or concave portions are disposed."

Neither Mori, nor Kimura, taken singularly or in combination, teaches or suggests a relationship between the maximum length of the independent member base portion and the inner diameter of the nozzle, prior to disposing the protrusion portions or concave portions.

The Examiner states that it would have been obvious to "proclaim $L \leq \pi D/3$ since our reviewing courts have held that where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device." *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338 (Fed. Cir. 1984). (*See* Office Action, page 3, #4).

Contrary to the above statement, the device of claim 2 performs differently from a proposed combination of Mori and Kimura. Applicants of the present application demonstrated by multiple examples discussed in the specification how the dimensions of the protrusions/concaves affect depositions of material in the inner hole. The Examiner improperly relies solely on the decision and facts of *Gardner* to establish obviousness.

Accordingly, Applicants respectfully submit the Examiner did not establish *a prima facie* obviousness. Additionally, it is not obvious to "proclaim" the specific recited dimensions, as the Examiner contends, at least for the reasons discussed above.

Accordingly, **claim 2** is patentable over Mori and Kimura.

Claim 10 recites: "an angle between a nozzle inner pipe and a lower end portion of each of said protrusion portions ... is selected to be equal to or less than 60° to prevent generation of a stagnation portion on an area of the inner hole portion disposed under the protrusion portion."

The Examiner asserts that the "dimples" of Kimura have the potential to be at about 60 degree angle. (*See* Office Action, page 4, #8). As discussed above, the holes of Kimura only exist on the surface of the openings 5.

The Examiner further states that discovering a result effective variable only involves routine skill in the art. However, a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. MPEP § 2144.05. Accordingly, it needs to be demonstrated that an angle between a nozzle inner pipe and a lower end portion of each protrusion portion selected to be equal to or less than 60° has been recognized a result effective variable in the prior art to prevent generation of a stagnation portion on an area of the inner hole portion disposed under the protrusion portion.

Accordingly, the rejection is improper and **claim 10** is patentable.

Claim 19 recites "a straight immersion nozzle having the inner diameter before the protrusion portions or concave portions are disposed of a substantially invariable value in the direction parallel to the molten steel flowing direction."

The Examiner states that Muench teaches a tapered portion 46a before any protrusions in FIG. 3. (*See* Office Action, page 5, #13).

Muench describes a rotating ejection nozzle 36 with a channel 46 which gradually expands in diameter from the entry 46a to the exit 46b. (Col. 4, lines 47-54, Fig. 3).

But, claim 19 recites a straight immersion nozzle.

Muench is directed to the rotating ejection nozzle which operates by spreading a flow of molten metal from the end of the nozzle. (Fig. 3). Accordingly, Muench is not in the field of the immersion nozzles and, additionally, is not reasonably pertinent to the problem of preventing the deposition of the alumina in the inner hole - the problem with which the inventor was concerned.

The immersion nozzle is the nozzle which casts by immersing in a molten metal tank, as described, for example, in the specification on page 30, line 3 to page 31, line 15. The device (nozzle) of the present invention is not of the spray type like that of Muench, but is an immersion nozzle having its lower end portion (at least along a length of 10 mm) immersed in a molten metal.

Accordingly, Muench is not analogous art and/or teaches away from the present invention and should be withdrawn.

Accordingly, the rejection is improper and **claim 19** is patentable.

CONCLUSION

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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